YASKAWA

Application Overview: Dust and Vapor Collection

Variable Frequency Drives Optimize Performance and Reduce Cost

Will Kastner, Drives Application Specialist
Yaskawa America, Inc.

Summary of Applications

The process of collecting dust or purifying air during manufacturing processes has been in existence almost since the first goods were manufactured and there are countless air handling companies that provide dust and vapor collection (DuC, VC) through their existing HVAC or air handling business. The concept of dust and vapor collection and mitigation has gone through several technological and conceptual advances over the years to keep pace with manufacturing innovations. Initially, the purpose of DuC and VC was mitigation rather than collection. Blown air, water or collection bags were used to control fumes and dust. As production and manufacturing processes increased in productivity, the DuC and VC systems migrated toward individual process mitigation systems located at the process centers; while still using a centralized system.

In recent years, innovations in manufacturing technology have required the DuC and VC application to evolve. Using the drives ability to manage and control different input signals such as PLCs, discreet I/O and pressure information allow for more complex systems. Some of the notable applications of DuC and VC mitigation are:

- Cement
- Metal and Metal fabrication
- Rubber
- Chemical
- Food and Beverage
- Exhaust Applications
- Paint
- Textiles
- Wood Furniture
- Welding
- Construction Timber and Panels
- Insulation
- Automotive
- Grain
- Livestock

Variable Frequency Drives on Dust and Vapor Collection Systems

Variable frequency drives (VFDs) provide several advantages when controlling the airflow within a DuC or VC system.

- Reduced maintenance cost due to automatic speed adjustment.
- Increased filter life as a result of the collector always operating at the optimum air to cloth ratio.
- Substantial cost savings associated with reduced speed operation, leading to quick return on investment.

VFDs take the human interaction out of fan adjustment. As the collector's filters begin to plug, the velocity of air entering the collector drops. The VFD senses the decrease in flow via a pressure transducer located in the dirty air inlet duct. The VFD automatically increases the speed of the fan and returns the system to the optimal operating point of flow and air to cloth ratio [1].

The automation of the adjustment process benefits collector owners by eliminating the cost of routinely adjusting the outlet damper. The automatic adjustment also reduces the amount of human intervention required by the collector, reducing the likelihood that the damper may be adjusted improperly, ensuring the collector operates at the optimum air-to-cloth ratio and preventing premature filter failure.

The largest benefit of the VFD to the collector owners is the energy cost savings that comes with the reduced fan speed. A fan curve matching the collector airflow exactly will include one or two inches of additional static pressure to accommodate unexpected obstacles and changes in filter condition. With a system automatically maintaining design airflow, the risk of material in the duct falling out of the airstream is decreased and a less conservative conveying velocity can be selected [2].

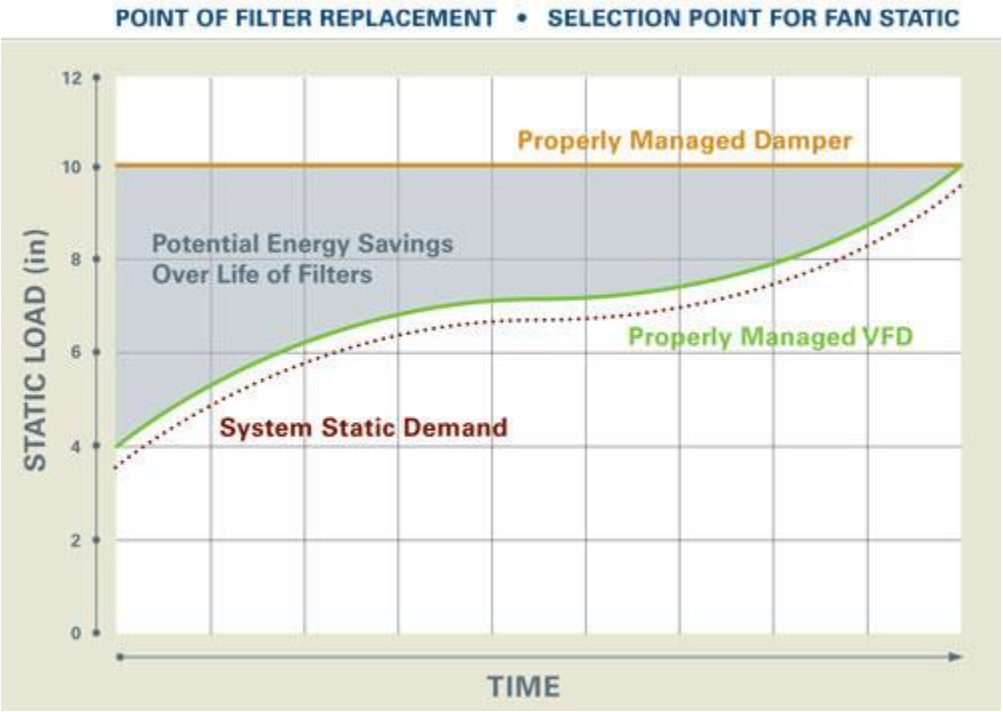

Figure 1 Design System Static [2]

The amount of power the fan draws varies with the cubic ratio of the change in speed, e.g., a fan with a 25% reduction in speed consumes only 42% of the full speed power, and the same fan with a 50% reduction in speed consumes only 12% of the full speed power. The customer can save an average of 30% on their energy cost to operate the collector [1].

A system with a VFD air flow controller does cost more initially, but the Return on Investment (ROI) based on energy savings alone is usually less than two years, and this does not include any additional savings resulting from longer filter life and better process control [2].

By optimizing the airflow in your dust, fume or mist collector, a VFD air flow controller has proven to be the most reliable option because it delivers extended filter life, conserves energy, and ultimately saves money [2].

Sources:

1 Matt Witter, *VFDs are the Smart Choice for Every Dust Collection Application,* www.glacier-technology.com

2 Lori Lehner, *Optimizing Airflow on Dust, Mist and Fume Collection Systems*, www2.donaldson.com